SECTION 11301

AIR STRIPPING SYSTEMS
11/91

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C653	(1987) Disinfection of Water Treatment Plants
AWWA D100	(1986) Wire-Wound Circular Prestressed-Concrete Water Tanks
AWWA D103	(1987) Factory-Coated Bolted Steel Tanks for Water Storage

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	Occupational Safety and Health Standards

MILITARY SPECIFICATIONS (MS)

MS DOD-C-24654	(Basic) Coatings, Epoxy, Potable Water Tanks (Metric)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(1993) Enclosures for Industrial Control and Systems

1.2 UNIT PRICES

Payment for water treated will be as described in the Payment Schedule of the Bid Form.

1.3 SYSTEM DESCRIPTION

The air stripping system shall be the once-through counter-current, forced draft or induced draft tower type filled with mass transfer packing designed for the removal of volatile organic compounds (VOC) from wastewater.

1.3.1 Design Requirements

Design, fabrication, and erection shall be in accordance with AWWA D100or AWWA D103 except as modified herein.

Design Life

Minimum	[_____] years

Air Stripper system dimensions

Maximum vertical projection	[_____] mm [_____] ft
Maximum ground surface coverage	[_____] mm x [_____] mm [_____] ft x [_____] ft
Soil bearing capacity	[_____] MPa [_____] psf
Seismic zone	[_____]
Wind speed	
Maximum	[_____] km/h [_____] mph
Ground snow load	[_____] kPa [_____] psf
Ambient air temperature	
Maximum	[_____] degrees C [_____] degrees F
Minimum	[_____] degrees C [_____] degrees F

1.3.2 Influent Chemical Conditions

Known influent inorganic chemical concentrations of [waste water] [water from surface impoundment] [ground water]:

pH	[_____]	Minimum
	[_____]	Average
	[_____]	Maximum
Total Hardness	[_____]	mg/l Maximum as CaCO3
	[_____]	mg/l Average
Iron	[_____]	mg/l Maximum
	[_____]	mg/l Average
Manganese	[_____]	mg/l Maximum
	[_____]	mg/l Average
Calcium	[_____]	mg/l Maximum
	[_____]	mg/l Average
Magnesium	[_____]	mg/l Maximum
	[_____]	mg/l Average
Sodium	[_____]	mg/l Maximum
	[_____]	mg/l Average

Potassium	[_____]	mg/l Maximum
	[_____]	mg/l Average
Total alkalinity	[_____]	mg/l Maximum as CaCO3
	[_____]	mg/l Average
Hydroxide alkalinity	[_____]	mg/l Maximum as CaCO3
	[_____]	mg/l Average
Carbonate	[_____]	mg/l Maximum
	[_____]	mg/l Average
Bicarbonate	[_____]	mg/l Maximum
	[_____]	mg/l Average
Sulfate	[_____]	mg/l Maximum
	[_____]	mg/l Average
Nitrate	[_____]	mg/l Maximum
	[_____]	mg/l Average
Chloride	[_____]	mg/l Maximum
	[_____]	mg/l Average
Fluoride	[_____]	mg/l Maximum
	[_____]	mg/l Average

1.3.3 Performance Requirements

Capacity and design of the air stripper and accessories shall be suitable for 24-hour full load service in an outdoor location. Number of units and flow rates shall be as follows:

Number of stripping units

Minimum [_____] [2] units

Packing surface area

Minimum [_____] square meter/cubic meter [_____] sf/cu. ft.

Water/wastewater flow rate

Maximum [_____] liters per second [_____] gpm

Minimum [_____] liters per second [_____] gpm

Water/wastewater temperature

Maximum [_____] degrees C [_____] degrees F

Minimum [_____] degrees C [_____] degrees F

Air to water ratio

Maximum @ maximum flow [_____] percent

Minimum @ minimum flow [_____] percent

Percentage of flooding at maximum water flow and maximum air to water ratio

Maximum [80] [85] percent

Mist eliminator separation efficiency at maximum water flow and maximum air to water ratio

Minimum [80] [85] percent

Water/Wastewater temperature

Maximum [_____] degrees C [_____] degrees F

Minimum [_____] degrees C [_____] degrees F

1.3.4 Influent and Effluent Organic Contaminant Concentrations

For [_____]
Maximum Influent [_____] micrograms [_____] ug/L
Average Influent [_____] micrograms [_____] ug/L
Maximum Effluent [_____] micrograms [_____] ug/L
Removal Required [_____] percent
Mass transfer rate at maximum loading

Minimum [_____] cubic meters/second [_____] cu. ft./sec

Removal percentage will be determined as follows:

((Influent concentration - Effluent concentration)/Influent concentration) times 100 percent

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Air Stripping System; [_____].

Design calculations for air stripping system indicating removals of each of the organic compounds listed.

Packing, mist eliminator, stripper, instrumentation and controls, dimensions, capacities, make and model, materials of construction, manufacturing description and technical literature, air and water pressure drops thru each component of the system, including line sizing, hydraulic loading (liters/square meter, gal/sq. ft,) air volume (cubic meter/second, CFM,) A:W ratio, valving, and pressure gauges.

Structural Calculations; [_____].

Calculations for the tower shells, concrete foundations and mounting and support details.

SD-04 Drawings

Equipment and Materials; [_____].

Process flow diagrams and instrumentation diagram(s) showing all major pieces of process equipment with controls. Detail drawings consisting of a complete list of material, including manufacturer's descriptive and technical literature, catalog cuts, drawings, and installation instructions. Packing, mist eliminator, stripper, instrumentation and controls, equipment, dimensions, capacities, make and model, materials of construction, site layout, line sizing, valving, and pressure gauges. Detail drawings shall demonstrate that the system has been coordinated and will function as a unit. Drawings shall show proposed layout and mounting and relationship to other parts of the work.

SD-06 Instructions

Air Stripping System; [_____].

Framed instructions. Installation instruction procedures, sequences, and precautions, including tolerances for level, horizontal, and vertical alignment. Grouting requirements including grout spaces and materials.

SD-07 Schedules

List of Equipment; [_____].

Parts list including recommended spare parts and maintenance supplies with current unit prices and source of supply for each item of operable equipment. List of all special tools, instruments, accessories, and special lifting and handling devices required for periodic maintenance, repair, adjustment, and calibration.

SD-09 Reports

Field Tests; [_____].

Reports in booklet form, upon completion of testing of the installed system. Test reports shall include all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of all controls. Performance test data shall be reflected in the operating instructions.

SD-13 Certificates

Materials and Equipment; [_____].

Where material or equipment is specified to comply with requirements of UL, proof of such compliance. A letter of findings, certifying UL inspection of all lightning protection systems provided on buildings used for manufacturing, processing, handling or storing explosives, ammunition, or explosive ingredients shall be included.

Verification from a Registered Professional Engineer registered in the state in which the system is to be installed that the structural calculations for the tower shell, ladder, platform, cage, foundation, and lifting lugs were designed for the listed conditions in accordance with the

appropriate codes and standards.

SD-19 Operation and Maintenance Manuals

Air Stripping System; [_____].

The following information can either be included in the manual or manufacturer literature that contains the information and is furnished with the O&M Manuals. Each manual shall have an index listing the contents. Manuals shall be bound in sturdy three-ring, loose-leaf binders.

[Six] [_____] complete copies of operating instructions outlining the step-by-step procedures required for system startup, normal operation, short- and long-term deactivation, and shutdown. An introduction and overall equipment description, purpose, functions, and simplified theory of operation shall be included in the beginning of the instructions. The instructions shall include the manufacturer's name, model number, service manual, parts list and brief description of each piece of equipment and its basic theory and operating features. The instructions shall include piping and component layouts and wiring and control diagrams for the systems as installed. Performance test data shall be reflected in the operating instructions.

[Six] [_____] complete copies of maintenance instructions listing routine maintenance procedures, calibration procedures, possible breakdowns and repairs and trouble shooting guides. List showing lubricants for each item of mechanical equipment, approximate quantities needed per year, and recommended lubrication intervals; and where possible, types of lubricants shall be consolidated with equipment manufacturers' approval to minimize the number of different lubricants required for plant maintenance.

1.5 QUALIFICATIONS

1.5.1 Contractor

Contractor shall have had a minimum of [2] [3] [5] [_____] years experience in the construction of water, wastewater, and/or industrial wastewater, and/or industrial wastewater pretreatment plants.

1.5.2 Single Source Supplier

The Contractor shall assign to a single supplier full responsibility for the furnishing of the prepackaged air stripping system. The designated single supplier, however, need not manufacture the system but shall coordinate the design, assembly, installation, and testing of the entire system as specified herein.

1.5.3 Stripping Tower Fabricator

Stripping tower fabricator shall prepare the fabrication and erection drawings under the direct supervision of an engineer licensed to practice structural engineering in the state in which the system is to be installed.

1.5.4 Manufacturer's Representative

Services of a manufacturer's field service representative who is experienced in the installation, adjustment, and operation of the equipment furnished and who has complete knowledge of the proper operation and maintenance of the system shall be provided.

1.5.5 Welding

Welding qualifications of welding procedures, welders, and welding operators shall be in accordance with Sections 8.2 and 8.8 of AWWA D100.

1.6 PRE-INSTALLATION CONFERENCE

Pre-installation conference may be required by the Contracting Officer. The Contractor shall ensure that all of the involved subcontractors, suppliers, and manufacturers are represented. The date and time of the conference shall be furnished to the Contracting Officer for approval.

1.7 DELIVERY, STORAGE, AND HANDLING

All parts shall be preassembled to the largest extent possible, compatible with transportation limitations and equipment protection considerations. Field assembly, if any, shall require merely bolting together of match-marked components. Equipment shall be crated and delivered to protect against damage during shipping. Flange faces shall be protected from damage. All openings shall be covered to prevent entrance of dirt, water and debris. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation. Finished iron or steel surfaces shall be properly protected to prevent rust and corrosion. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust, and other contaminants.

1.8 SEQUENCING AND SCHEDULING

Blowers and ductwork specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM. Connecting piping shall be connected to the air stripping equipment with minimal delay.

1.9 GENERAL REQUIREMENTS

1.9.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate equipment that has been in satisfactory operation for at least two years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.9.2 Nameplates

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

1.9.3 Safety Requirements

Belts, chains, couplings, and other moving parts shall be completely enclosed by guards to prevent accidental personal injury in accordance with 29 CFR 1910, Subpart O, Machinery and Machine Guarding. Guards shall be removable or so arranged as to allow access to the equipment for maintenance.

1.9.4 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

PART 2 PRODUCTS

2.1 AIR STRIPPER SYSTEM COMPONENTS

The air stripping system shall be the once-through counter-current, forced draft or induced draft tower type filled with mass transfer packing designed for the removal of volatile organic compounds (VOC) from wastewater.

2.1.1 Off Gas Control

Off gases from air stripper tower shall be conveyed to an air pollution control unit for [treatment as specified in Section [_____] VAPOR PHASE CARBON ADSORPTION SYSTEMS.] [incineration as specified in Section 11500AIR POLLUTION CONTROL.]

2.1.2 Packing

The tower shall be filled with high efficiency open packing, either structured "arranged" or random "dumped" media. Media may be polypropylene, PVC, stainless steel, ceramic or other media that is durable under the service conditions. [Packed section of the tower shall be between [_____] and [_____] mm [_____] and [_____] feet in diameter and the height of the packing shall be between [_____] and [_____] mm.[_____] and [_____] feet.

2.1.3 Mist Eliminator

The mist eliminator shall have the minimum separation efficiency stated in the performance requirements. Materials for the mist elimination system must be resistant to all water and contaminant components at all concentrations.

2.1.4 Tower Internals

Internals shall include but not be limited to influent water distributor, packing supports, and water redistributors. Galvanized steel, coated steel, or other corrodible metal internals shall not be used.

2.1.4.1 Water Distribution System

Water distribution system shall be PVC, 304 stainless steel, or aluminum full cone spray nozzle or distributor tray, that distributes the water over the fill area of the packing. Water distribution system shall produce a minimum of [125] [50] [_____] streams/sq. m ([12] [4.8] [_____] streams/sq. ft) [12] [4.8] [_____] streams/sq. ft at the normal pumping rate. The distribution system shall be designed for easy removal and replacement. If a full cone spray nozzle is used it must be placed at the corrected distance for the top of the packing so that it distributes the spray uniformly over the top of the packing. Water redistribution systems shall be as recommended by the manufacturer. Distance between re-distributors shall not exceed [_____] mm [_____] ft and shall be less if recommended by

the packing manufacturer.

2.1.4.2 Packing Support Plate

Packing support shall be fiberglass reinforced plastic, aluminum, or 304 stainless steel. If the bed depth exceeds the packing manufacturer's recommended maximum vertical depth of packing, an intermediate support plate shall be installed.

2.1.5 Tower Shell and Structure

2.1.5.1 Loading

Tower shells and appurtenances shall be structurally fabricated for the seismic zone and wind loads listed in the performance requirements, plus live and dead loads of the tower shell full of water.

2.1.5.2 Guy Wires

Air strippers shall be free standing and supported entirely by anchoring in a concrete base and shall be compatible with the dimensional constraints indicated. Each column shall be self supporting. A superstructure or frame not extending beyond the foundation will be permitted. No guy wires shall be allowed.

2.1.5.3 Lifting Lugs

Towers and other major components shall be provided with lifting lugs as necessary for easy handling with a crane or similar device during installation, maintenance and replacement of tower internals.

2.1.5.4 Assembly

The system shall be factory pre-assembled into reasonably sized modules for easy field assembly and mounted on a skid. The skid shall have a welded steel frame with [2.4 mm (3/32 inch)] [6.4 mm (1/4 inch)] [3/32] [1/4] inch thick steel plate or fiberglass reinforced plastic (FRP) grating with ultraviolet (UV) inhibitors decking.

2.1.6 Tower Shell Materials

Tower shells shall be constructed of fiberglass reinforced plastic (FRP) with ultraviolet (UV) inhibitors, [304], [316] stainless steel, structural grade aluminum, steel with a coating as specified, or suitable seamless, one piece molded modular sections of a plastic material such as polyethylene, or polypropylene with UV inhibitors to prevent decomposition from sunlight. Fabrication shall conform to the manufacturer's recommended fabrication procedures. Steel and other tank materials shall conform to the applicable provisions of Section 2 of AWWA D100 or Section 2 of AWWA D103. The design, fabrication, and erection shall be in accordance with the applicable requirements of AWWA D100 or AWWA D103 except as modified herein and in the design requirements of this specification. Shop Fabrication shall conform to Section 9 of AWWA D100 or Section 7 of AWWA D103.

2.1.7 Access

The top of each tower shall be bolted on so as to provide access to tower internals from above.

2.1.8 Exhaust Stack

Exhaust stack shall be sized to not exceed a gas velocity of 7.5 m/s25 feet per second and not be less than 3 m/second. 10 feet per second.

2.1.9 Manholes and Pipe Connections

Section 7 of AWWA D100 and Section 5 of AWWA D103 represent the minimum requirements. Number, type, location, and size of manholes and pipe connections shall be as shown on the drawings and as specified herein. Flanged access ports, [460 mm (18 inch)] [525 mm (21 inch)] [600 mm (24 inch)] [18] [21] [24] inch in diameter, shall be provided, and shall be water and vapor tight and able to withstand all loads and internal pressures during construction, operation, and cleaning. One or two access ports shall be at the top of the column for access to the mist eliminator and liquid distributor and one shall be located near the bottom of the column to provide removal of the packing and packing support. One shall provide access to the sump. Additional ports shall be provided if packing fouling is expected to be a problem. Influent pipe connections shall be full line diameter of the connecting pipe. Effluent pipe connections may be made with standard reducing fittings if there is adequate vertical run to avoid back-up.

2.1.10 Tank Accessories

Tank accessories shall conform to Section 7 of AWWA D100 or Section 5 of AWWA D103 and as specified. Fasteners and hardware shall be Type 304 stainless steel. Additional requirements for accessories are as follows.

2.1.11 Sump

The bottom of each column shall have a clear well. It shall be sized so that it has a minimum residence time of [2] [5] [10] minutes when the stripper is operating at the specified capacity. A sump inspection port and a 15 mm (1/2 inch) 1/2 inch diameter (minimum) drain/sample port with manually operated valve shall be provided at the bottom of the sump to completely drain the column.

2.1.12 Instrumentation and Controls

The air stripper system instrumentation and controls shall consist of the following:

a. System emergency shutdown controls.

b. Control to shut down the system and activate an alarm if the blower fails.

c. Interlock for concurrent operation of blowers and influent [pumps] [control valves].

d. [Influent].

e. [effluent] sump[s] with high level alarm light and horn, automatic alternation of pumping lead, lag, and standby, pump on light for each pump, pump off light for each pump, low level alarm light.

f. Water flow indicators [_____] liters per second to [_____] liters

per second. [_____] gpm to [_____] gpm.

g. Column effluent water temperature gauge [_____] degrees C to [_____] degrees C. [_____] degrees F to [_____] degrees F.

h. Column pressure drop instrument [_____] mm to [_____] mm[_____] in. to [_____] in. water.

i. Direct reading pressure gauges in the air inlet and outlet throats.

j. Water pressure gauge of the direct-reading type, equipped with a shutoff cock shall be provided in the valve chamber, on the tank side and on the discharge side of the check valve.

k. Gauges shall have 150 mm (6 inch) 6 inch dials, shall be stem mounted, and shall conform to ASME B40.1. Accuracy of gauges shall be Grade A or better. Gauges shall be calibrated in kilopascals and pounds per square inch pounds per square inch in not more than 10 kPa and 2 pound 2 pound increments from 0 to 350 kPa and 0 to 50 pounds 0 to 50 pounds in excess of the normal operating pressure at the tank.

2.1.13 Cleaning Package

[The air stripper shall be furnished with a cleaning package which can be operated periodically to remove mineral deposits and/or biological growth which may foul the column packing and adversely affect the unit's performance.] [The air stripper shall be designed for a cleaning procedure during which the air stripper will be isolated and filled or flooded with a 10 percent maximum sulfuric acid solution. The stripper shall be designed for easy removal of the packing.] [The package shall include a corrosion-resistant pump, chemical addition port, and plumbing accessories to allow the recirculation of cleaning solutions from the tanks through the column. The system shall include tanks, pipes and valves to allow column flushing with chemical cleaners, biocides or disinfectants.]

2.1.14 Chemical Feed Systems

Chemical feed requirements are as specified in Section 11242 CHEMICAL FEED SYSTEMS and/or Section 11241 CHLORINE-FEEDING MACHINES (AUTOMATIC, SEMIAUTOMATIC AND MANUAL).

2.1.15 Ladders, Platforms and Cages

The air stripper shall be provided with a platform at the top of the column, and an access ladder. A platform shall provide access to each access port. Catwalks, ladders, cages, and guardrails shall be provided where indicated or required for safe operation and maintenance of equipment and in accordance with Sections 7.4 and 7.5 of AWWA D100 or Sections 5.4 and 5.5 of AWWA D103. Provision shall be made for the attachment of a scaffold cable support at the top of the roof on welded tanks. Ladders shall have side rails and have non-slip rungs which are a minimum of 19.1 mm (3/4 inches) 3/4 inches in diameter and 406.4 mm (16 inches) 16 inches long. The access ladder shall start [at ground level.] [at 2.5 m (8 feet) 8 feet above the ground.] The distance between rungs shall not exceed 305 mm. 12 inches. The ladder and platform shall bolt onto brackets that are welded to the towers, or shall be welded directly to the tower. Platforms shall be designed to support a uniform live load of 3.6 kPa (75 psf) 75 lbs. per square foot plus the dead load of the structure. The platform

shall be a minimum of 915 mm 3 feet wide and fabricated from steel, aluminum, or fiberglass reinforced plastic. Grating openings shall have no dimension greater than 25 mm. 1 inch.

2.2 ACCESSORIES

2.2.1 Insulation for Freeze Protection

Insulation shall be provided in accordance with Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS. The system shall be insulated and jacketed to prevent freezing under the most severe conditions stated in the performance requirements with a water temperature drop of less than 3 degrees C. 5 degrees F.

2.2.2 Transfer Pumps

The transfer pump shall be in accordance with Section [11212 PUMPS: WATER, VERTICAL TURBINE] [11211 PUMPS: WATER, CENTRIFUGAL].

2.2.3 Blowers and Ductwork

Blowers and ductwork shall be as specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

2.2.4 Electrical Work

2.2.4.1 Electrical Equipment and Wiring

Electrical motor-driven equipment specified herein shall be provided complete with motor control centers, panels, motor starters, etc. Electrical equipment and wiring, including power and control wires shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Process control shall be as specified [in this specification and related equipment specifications.] [in Section [_____] INSTRUMENTATION AND CONTROLS.] [Electrical characteristics shall be as indicated.] [The maximum power requirement during startup and during normal operation shall be as specified.] Motor starters shall be provided complete with properly sized thermal overload protection in each phase and other appurtenances necessary for the motor control specified. Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor when operating at proper electrical system voltage and frequency. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices but not shown on electrical plans shall be provided under this section of the specifications.

2.2.4.2 Power and Control Panels

Power and control panels shall be fabricated in accordance with the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. The Contractor shall be responsible for fabrication of the power and control panels. The power and control panels shall be furnished in a type [_____] enclosure in accordance with NEMA ICS 6 to be located near the air stripping system, (unless the air stripper control panel is inside a structure). The Contractor shall furnish conduit, power, and control wiring to the air stripping system from the power and control panel. The Contractor shall furnish and install at his expense any additional conduit, wiring, switchgear, and electrical accessories required for the air stripping

system.

2.2.5 Special Tools

One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of each type of equipment furnished shall be provided.

2.2.6 Spare Parts

Spare parts shall be provided for each different item of material and equipment specified including all of the parts recommended by the manufacturer to be replaced after [1 year] [and] [3 years] service.

2.3 FABRICATION

Welding shall be in accordance with Section 8 of AWWA D100 or Section 6 of AWWA D103. Fabrication shall be in accordance with Section 9 of AWWA D100 or Section 7 of AWWA D103.

2.4 FRAMED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures, for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting.

PART 3 EXECUTION

3.1 PREPARATION

Reinforced concrete foundation for each air stripper system equipment and tower shall be in accordance with Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE and with Section 03200 CONCRETE REINFORCEMENT. Foundations for the tower shall be designed in accordance with Section 12 of AWWA D100 or Sections 11 and 8.5 of AWWA D103 for earth, with the bearing value stated in the design requirements. An AWWA D100 Type 1 or an AWWA D103 Type 1 or Type 2 foundation shall be provided for the stripper. Factor of safety on overturning under design wind load shall be 1.5 minimum. When a footing is required, an inverted truncated pyramid of earth with 2 on 1 side slopes above top of footing may be used in determining overturning stability. The elevation at the top of the foundations shall be not less than 200 mm 8 inches above the finished grade.

3.2 ANCHORS

3.2.1 Number of Anchors

An adequate number of anchors designed to prevent overturning of the tower when empty shall be installed. If anchor bolts are used, the nominal diameter shall be not less than 25 mm (1 inch), one inch, plus a corrosion allowance of at least 6.4 mm (1/4 inch) 1/4 inch on the diameter. If anchor straps are used, they shall be pre-tensioned before welding to the shell.

3.2.2 Anchor Bolts

Bolts shall be a right angle bend, hook, or plate washer, while anchor straps shall have only a plate welded to the bottom. The anchors shall be inserted into the foundation to resist the computed uplift.

3.2.3 Attachment

Attachment of anchors to the shell shall not add localized stresses in excess of the material tolerance to the shell. The method of attachment shall consider the effects of deflection and rotation of the shell. Anchors shall not be attached to the shell bottom. Attachment of the anchor bolts to the shell shall be through stiffened chair-type assemblies or anchor rings of adequate size and height.

3.3 EXCAVATING, FILLING, AND GRADING

Excavating, filling, and grading shall conform to the applicable requirements of Section 02221 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

3.4 INSTALLATION

Equipment shall be installed as shown and in accordance with the written instructions of the manufacturer, under the direct supervision of the manufacturer's representative, and in accordance with the applicable provisions of Section 10 of AWWA D100 or Section 8 of AWWA D103.

3.5 TESTS

3.5.1 Hydrostatic Tests

Each unit shall be hydrostatically tested by completely filling the column with water and inspecting for leaks. Leaks shall be repaired and the column retested. Equipment shall be checked for leaks after it has been filled for at least one hour. Tank inspections and testing shall be in accordance with Section 11 of AWWA D100 or Section 9 of AWWA D103. [Mill and shop inspections shall be performed by an approved commercial inspection agency.] [Radiographic inspections of the welded tank shell shall be performed by the Contractor.] The Contractor shall perform the hydrostatic test and the vacuum box leak test of the tank bottom. Final leak test and hydrostatic test shall be performed before painting of welded tanks.

3.5.2 Performance Testing

Each unit shall be operated at the maximum flow specified in the performance requirements for at least one hour prior to sampling.

3.5.3 Influent and Effluent Sampling

The Contractor shall collect samples in the presence of the Contracting Officer and transport the samples to the laboratory for analysis in accordance with Section 01450 CHEMICAL DATA QUALITY CONTROL.

3.5.4 Influent and Effluent Analyses

All equipment shall be inspected and tested under operating conditions

after installation. The unit must be demonstrated to run without operator intervention for 72 contiguous hours. If inspection or test shows defects, such defects shall be corrected, and inspection and test shall be repeated. Performance shall be tested in accordance with [Section 01450CHEMICAL DATA QUALITY CONTROL [_____].

3.5.5 Discharge

During the performance testing, the effluent from the air stripper system shall be contained within a holding/mixing tank with no flow discharged to the [system.] [stream.] [sewer.]

3.5.6 Noncompliance with Performance Requirements

Removals shall meet or exceed those specified in the performance requirements of this specification. If at any time the results of the organic analyses of the influent and effluent water from the air stripping system indicate that the air stripping system is not in compliance with Contract Documents, flow through the air stripper shall be stopped and the system shall be said to be inoperable. If at any time the operation of the air stripping system does not meet the hydraulic, instrumentation, or control requirements set forth in this Contract, then flow through air stripping system shall be stopped and the system shall be said to be inoperable. The Contractor, upon notification of the air stripping system non-compliance, shall immediately proceed to repair or modify the system so that it is in compliance with the Contract Documents. Repairs or modifications shall be made entirely at the Contractor's expense. The Contractor shall notify the Contracting Officer one day before the air stripping system is to be restarted and retested.

3.6 PAINTING/CORROSION PREVENTION

3.6.1 Welded Tanks

3.6.1.1 Exterior Surfaces

The paint system applied to the outside of the tank shall be in accordance with Section 09900 PAINTING, GENERAL. Factory primed surfaces shall be solvent-cleaned before painting. Surfaces that have not been factory primed shall be prepared and primed in accordance with the paint manufacturer's recommendations.

3.6.1.2 Interior Surfaces

A prime coat at least 0.08 mm 3.0 mil thick and a [white] [_____] final coat at least 0.13 mm 5.0 mil thick shall be applied. Each coat shall be a two-component catalyzed epoxy in accordance with MS DOD-C-24654. The primer shall contrast with the color of the finish coat. The second, third, and fourth coats shall be of contrasting color. The top side of support beams and underside of roof plates shall be sandblasted and primed before support beams are welded in place. These areas shall then be wedged and painted. After the paint has dried, the wedge shall be removed and placed in a different area so that the area initially covered by the wedge can be painted. The above procedure shall be repeated on each coat of paint that is applied. When surface and ambient temperature of 10 degrees C 50 degrees F and higher will not be maintained, heating of the interior of the tank shall be employed.

3.6.2 Bolted Tanks

The tanks shall have a coating applied to both the interior and exterior surfaces in accordance with Section 10 of AWWA D103. Color shall be as approved.

3.6.3 Touch-up painting

Factory painted items shall be touched up as needed. These items shall be cleaned of all foreign material and shall be primed and topcoated with the manufacturer's standard factory finish.

3.6.4 Corrosion Resistant Metals

Painting of corrosion resistant materials such as copper, brass, bronze, copper-nickel, and stainless steel is not required unless otherwise specified.

3.7 MANUFACTURER'S FIELD SERVICE

Prior to startup, the equipment shall be inspected for alignment and connections by a factory representative. The manufacturer's representative shall inspect the final installation and supervise the adjustment and testing of the equipment.

3.8 STARTUP

After completion of all testing, the manufacturer's representative shall assist the plant operators in plant startup.

3.9 ADJUSTING, CLEANING, AND DISINFECTING

Adjustments within the control range shall be made to obtain optimum performance under actual field conditions. Cleaning [is] [and disinfection in accordance with AWWA C653 are] required prior to placing the unit in service.

3.10 DEMONSTRATION

The manufacturer's representative shall demonstrate that the system meets the performance requirements.

3.11 FIELD TRAINING

The Contractor shall conduct a training course of operating staff as designated by the Contracting Officer. The training period, for a total of [24], [36] hours of normal working time, shall start after the system is functionally complete but prior to final acceptance tests. The field instructions shall cover the topics included in the Operating and Maintenance Manuals.

-- End of Section --